REMARKS/ARGUMENTS

Claims 1, 3-11 and 15-34 are active in this application, claims 2 and 12-14 having been cancelled. Claims 1 and 19 have been amended to note that the antimicrobial properties are regenerable after one or more uses by contacting the composite item with a hypochlorite (bleach) solution. This amendment is supported by the specification at pages 7-8. No new matter has been added by these amendments.

The present invention relates to a method for providing anti-microbial properties to a composite item, by the use of an organic antimicrobial agent that is a silicone based quaternary ammonium salt. Further, the process is performed in an aqueous bath, which is particularly important for application by the typical consumer, who can apply the antimicrobial treatment directly in the washing machine. This avoids the presence of difficult to handle organic solvents or other potentially toxic materials.

Applicants have found that the use of such an antimicrobial agent provides antimicrobial properties even to composite items made from a wide variety of disparate yarn or fabric types. Further, this provides an anti-microbial property that is a "contact kill" property, as opposed to conventional metal based antimicrobial agents that act by a "poisoning" method. Further, as noted in the specification, the antimicrobial properties can last for 20-50 wash cycles, or more, due to the adherence or bonding of the antimicrobial agent to the components making up the composite item. Additionally, in a preferred embodiment now claimed in claim 1, the spent treatment liquid can be reused on a separate composite item. This step can be repeated multiple times with only the need to replenish the level of antimicrobial agent present in the bath as needed. Further, after one or more uses, the antimicrobial properties of the treated composite item can be regenerated by merely contacting the item (such as by washing) with a hypochlorite solution, such as common household bleach.

Claims 1, 4, 11 and 18 stand rejected under 35 U.S.C. 103 over Omura et al. Claims 1, 3-4, 7, 9, 11 and 18 stand rejected under 35 U.S.C. 103 over Rubin et al combined with Omura et al. Claims 1, 4-6, 9-10 and 18 stand rejected under 35 U.S.C. 103 over Brier combined with Omura et al. Claims 1, 3-5, 7, 9, 11, and 15-18 stand rejected under 35 U.S.C. 103 over Levy et al combined with Omura et al. None of the cited references suggest a composition whereby the silicon-based quaternary antimicrobial agent can be applied and then can be regenerated by merely washing the item with bleach, and none of the references suggest that the treating solution can be merely recycled for use in treating a further article.

Omura disclose the use of a quaternary ammonium salt-containing polysiloxane, wherein the substitutents on the siloxane are organic groups of 1-20 carbons, at least one quaternary ammonium salt containing organic group and organooxy groups. More importantly, as noted at column 7, lines 24-59, the treating agent of Omura is prepared by first dissolving the polysiloxane in an organic solvent, or by emulsifying using one or more types of emulsifiers. However, the disclosure of Omura discloses that the manner of treating the yarn apparently requires contacting the cloth with the treatment solution for one minute, followed by nip roll removal of excess treatment solution, and drying at temperatures of 135C, or one minute, and heat treatment at 165C for two minutes. In contrast, the present invention antimicrobial treatment merely requires immersion of the item to be treated, followed by separating the treated item from the bath, drying, followed by reuse of the treatment bath on a second composite item. Further, in a preferred embodiment, the drying step of the present invention is performed preferably at temperatures not exceeding 100C (see claim 16), and most preferably in a conventional household dryer (about 70-90C; see claim 17). Such a process permitting reuse of the treatment bath is nowhere disclosed by Omura. Additionally, Omura does not disclose a process as in the preferred embodiments of claims 16 and 17 wherein the drying temperature is kept at 100C or below.

Rubin also discloses a process that requires significantly high temperatures as part of a heat treatment after the fabric has been treated. However there is nothing within Rubin to suggest the regeneration of antimicrobial properties by contacting the treated item with hypochlorite solution. Applicants have found that surprisingly, the antimicrobial properties of the treated composite items of the present invention can be provided by use of very mild conditions in the treating process, such as those found within a conventional home washer and dryer, and can be regenerated by merely washing the item with an aqueous hypochlorite solution, i.e. common household bleach used in a common household washer. While not wishing to be bound by any particular theory of operation, it is believed that the antimicrobial properties of the present invention are provided by the "tail" of the organosilicon based agent acting as a spike to puncture the microbial organism, and effectively impaling the organism on the spike. This is cleaned, and the antimicrobial properties restored, by washing the used item with a bleach solution, which removes the detritus from the spike and regenerates the antimicrobial properties.

Certainly, neither Omura or Rubin disclose an antimicrobial treatment that can be performed as required in dependent claims 15-18, using a household washer and dryer, at temperatures less than 100C. Each of Omura and Rubin require the antimicrobial treatment to be applied with either the application or drying step being well above 100C, temperatures that are not reachable by common household clothes dryers.

The same holds true for Brier, which requires that the antimicrobial treatment step include passing through a drying frame at 325F (much higher than 100C, which is 212F). Additionally, there is nothing within Brier to suggest that use of the present invention process would result in a treated item whose antimicrobial properties can be regenerated by merely washing the item with a hypochlorite solution.

While Levy appears to suggest that forced hot air drying can be used in imparting the antimicrobial properties to their items, there is nothing to suggest that the quaternary silicon based antimicrobials of Omura could be so used. In fact, Omura requires much higher temperatures in their treatment process. Accordingly, there would be no reason to use lower temperatures, and in fact, one of ordinary skill in the art would not expect that such lower temperatures would be useable in treating items with an antimicrobial agent such as Omura's.

Since none of the cited references disclose or suggest the present invention as now claimed, the rejections should be withdrawn.

Claims 19-34 stand rejected under 35 U.S.C. 103 over Smith III in view of either Omura, Rubin, Brier or Levy. However, while Smith III discloses an antimicrobial agent such as that of the present invention, its combination with any of the cited references would not suggest the present invention, since there is nothing within the references to suggest that one can provide a composite item (made of two or more disparate materials) with antimicrobial properties using conditions that are mild such as those of a common household washer and dryer, with the treatment solution being reusable (preferred embodiment), and with the antimicrobial properties being able to be regenerated by merely contacting the treated item with a hypochlorite (bleach) solution after one or more uses. Since the references do not teach or suggest the present invention as now claimed, the rejections should be withdrawn.

Applicants submit that the application is now in condition for allowance and early notification of such action is earnestly solicited.

Respectfully submitted,

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